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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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WASHINGTON, DC 20036-3307

EXAMINER
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VERDIER, CHRISTOPHER M

ART UNIT	PAPER NUMBER
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3745

DATE MAILED: 07/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/725,180	<b>Applicant(s)</b> LOFTUS, PETER	
	<b>Examiner</b> Christopher Verdier	<b>Art Unit</b> 3745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 2-16-06, 5-1-06.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.  
4a) Of the above claim(s) 9 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 8, 11 and 12 is/are allowed.
- 6) ☒ Claim(s) 1-7, 10, 13-20 and 24-29 is/are rejected.
- 7) ☒ Claim(s) 21-23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 2-16-06 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

Applicant's amendments dated February 16, 2006 and May 1, 2006 have been carefully considered but are non-persuasive. The certified copy of the priority document has been received. The Replacement Sheets of Drawings overcome the various drawing objections and are accepted by the examiner. The abstract has been amended to overcome the objection thereto. The specification has been amended to overcome the objections thereto. The new title of the invention is acceptable. The claims have been amended to overcome the informalities therein and the rejections under 35 USC 112, second paragraph. Correction of these matters is appreciated.

With regard to claims 21 and 22, the specification still fails to provide antecedent basis for the subject matter of these claims. The new paragraph added at to the specification at page 13, before line 22 contains new matter as set forth later below.

With regard to Applicant's argument that amended claim 1 now recites that the control means is operable in an open loop control strategy dependent upon responses from the means to detect rub contact, and that in West 3,227,418, the control strategy is closed loop, the examiner agrees. However, Japanese Patent 6-137,106 teaches such an open loop control strategy as recited in the claims. With regard to Applicant's argument that in Soviet Union Patent 757,749 the control strategy is closed loop, the examiner disagrees. The Soviet Union Patent discloses means to close the gap 5 until rub contact between the tip edge and the casing, and means to detect rub contact 27 whereupon control means 25 act to open the gap to a desired value. The control means is operable in an open loop control strategy dependent upon responses from the

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means to detect rub contact. A closed loop control system utilizes an additional measure of the actual output in order to compare the actual output with the desired output response, and therefore the Soviet Union Patent is not a closed loop control system. Applicants' argument that in Colley 4,330,234, the control system is closed loop is not persuasive for the same reason, namely there is no utilization of an additional measure of the actual output in order to compare the actual output with the desired output response, because element 38 merely measures blade tip clearance and feeds this to the motor 37. Applicant's arguments (see Applicant's Remarks, page 2, third paragraph) that in European Patent 578,285, the control means is a closed loop system, are persuasive. The rejection of claim 28 under 35 USC 103(a) as being unpatentable over West 3,227,418 in view of European Patent Application 578,285 is withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of the teachings of Japanese Patent 6-137,106.

Applicant's arguments that neither West 3,227,418 nor Soviet Union Patent 757,749 discloses an open loop control strategy are not commensurate with regard to claims 24-25 and 27, because these claims do not recite this feature. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

### ***Specification***

The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). **Applicant is**

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**respectfully requested to carefully compare the following claims with the specification to verify that the recited claim language appears in the specification, and to amend the claims and/or specification accordingly. Correction of the following is required:**

Claim 21, last three lines, which recite that the responses to rub contact can be determined by the means to detect rub contact and/or the control means.

Claim 22, lines 1-3, which recite that the distinct responses from each singer element are determinable by the means to detect rub contact and/or the control means.

The amendment filed February 16, 2006 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: the new paragraph inserted at page 13 before line 22, which states that the means to periodically set a reference datum would be a program running within the control means, which would be either a separate computing device or part of a subsystem in the Engine Control Unit.

Applicant is required to cancel the new matter in the reply to this Office Action.

***Claim Objections***

Claim 28 is objected to because of the following informalities: Appropriate correction is required.

In claim 28, line 4, "an" should be changed to -- the --.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3-4, 13-14, 24, and 26-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Soviet Union Patent 757,749. Note the rotor system, comprising a rotary assembly 3 within a casing 1 with a gap between a tip edge of the rotary assembly and the casing, means to close the gap 5 until rub contact between the tip edge and the casing, and means to detect rub contact 27 whereupon control means 25 act to open the gap to a desired value. The control means is operable in an open loop control strategy dependent upon responses from the means to detect rub contact. The rotary assembly is formed from compressor blades secured about an unnumbered rotary bearing. The control means 25 also controls the means to close the gap 5 between the rotary assembly and the casing. The means to detect rub contact 27 comprises a sensor located to determine rub contact throughout the casing. Also disclosed is a method of regulating the gap in a gas turbine engine, comprising closing the gap until rub contact between

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the rotary assembly and the casing, detecting the rub contact, and opening the gap thereafter to a desired value. The engine is operated in accordance with the method.

Claims 1-2, 13-14, 16-17, and 24-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Japanese Patent 6-137,106. The Japanese Patent discloses a rotor system in a turbojet engine substantially as claimed, comprising a rotary assembly 1 within a casing 2 with a gap between a tip edge of the rotary assembly and the casing, means to close the gap 10 until rub contact between the tip edge and the casing, and means to detect rub contact 6 whereupon control means 9 act to open the gap to a desired value. The control means is operable in an open loop control strategy dependent upon responses from the means to detect rub contact. The means to detect rub contact is by detection of vibration. The control means also controls the means to close the gap between the rotary assembly and the casing. The means to detect rub contact 6 comprises a sensor located to determine rub contact throughout the casing. The control means acts dependent on the means to detect vibration in order to selectively open the gap to the desired value dependent on the vibration detected. The desired value for the gap and the speed of opening is dependent upon the severity of vibration. Also disclosed is a method of regulating a gap between the rotary assembly and the casing, comprising closing the gap until rub contact between the rotary assembly and the casing, detecting the rub contact via the sensor, and opening the gap thereafter to a desired value via actuator 10. The detection of rub contact is by determination of vibration upon the rub contact.

Claims 24-25 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by West 3,227,418. Note the rotor system in figure 9, using a method of regulating a gap in a turbojet engine between a rotary assembly 13 and a casing 20, comprising closing the gap until rub contact between the rotary assembly 13 and the casing 20, detecting the rub contact via sensor 65, and opening the gap thereafter to a desired value via actuator 39. The detection of rub contact is by determination of vibration upon the rub contact. The arrangement is provided in the turbojet engine. The engine is operated in accordance with the method.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 5-7, 13-14, 16-20, 26, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over West 3,227,418 in view of Japanese Patent 6-137,106. West (figure 9) discloses a rotor system in a turbojet engine substantially as claimed, comprising a rotary assembly 13 within a casing 20 with a gap between a tip edge of the rotary assembly and the casing, means to close the gap 39 until rub contact between the tip edge and the casing, and means to detect rub contact 65 whereupon control means 66/67 act to open the gap to a desired value. The means to detect rub contact is by detection of vibration, because the sensor 65 detects stresses or heat within the casing 20 that result from contact between the casing 20 and the blade



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tips, which are a measure of vibration caused by the rubbing contact. The means to close the gap 39 closes the gap by constriction of the casing, with the constriction being radial (see figures 4-5 and 7-8), and the constriction being tangential (see figure 6). The control means 66/67 also controls the means to close the gap 39 between the rotary assembly and the casing. The means to detect rub contact 65 comprises a sensor located to determine rub contact throughout the casing. The control means 66/67 acts dependent on the means to detect vibration in order to selectively open the gap to the desired value dependent on the vibration detected. The desired value for the gap and the speed of opening is dependent upon the severity of vibration.

Concerning claims 18, 19, and 29, the recitation that the means to detect rub contact 65 will allow determination of the point of rub contact by a triangulation technique is a recitation of intended use. A recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. Concerning claim 20, which recites that the means to detect rub contact may utilize time of flight or propagation determination in order to approximate rub contact position between the tip edge and the casing, the term “may” is not a positive recitation and is a recitation of intended use. Therefore, West can be considered such that the means to detect rub contact 65 may utilize time of flight or propagation determination in order to approximate rub contact position between the tip edge and the casing.

However, West does not disclose that the control means is operable in an open loop control strategy. Rather, the control means operates in a closed loop control strategy.

Japanese Patent 6-137,106 (figure 3) shows a control arrangement for regulating a gap between a rotary turbine blade 1 within a casing 2, with the gap between a tip edge of the rotary blade and the casing, means to close the gap 10 until rub contact between the tip edge and the casing, and means to detect rub contact 6 whereupon control means 9 act to open the gap to a desired value, for the purpose of providing a simplified blade tip clearance control strategy.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to form the control means of West such that it is an open loop control system, as taught by Japanese Patent 6-137,106, for the purpose of providing a simplified blade tip clearance control strategy.

Claims 10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over West 3,227,418 and Japanese Patent 6-137,106 as applied to claim 1 above, and further in view of Colley 4,330,234. The modified rotor system of West shows all of the claimed subject matter, including a means to close the gap 39, and a sensor 65. However, West does not show that the means to close the gap between the rotary assembly and the casing is by axial displacement of casing segments mounted upon an eccentric rotation arrangement whereby rotation of the eccentric rotation arrangement alters the angular presentation between each segment and the rotary assembly in order to vary the gap between them to the desired value (claim 10), and does not show that the sensor comprises multiple sensors (claim 15).

Colley shows a rotor tip clearance control arrangement whereby a means to close a gap 37 between a rotary assembly 16 and a casing 18 is by axial displacement of casing segments of 18 mounted upon an eccentric rotation arrangement 27 whereby rotation of the eccentric rotation arrangement alters the angular presentation between each segment and the rotary assembly in order to vary the gap between them to the desired value, with multiple sensors 42 that sense the clearance, for the respective purposes of providing high actuating forces on the casing to overcome sealing forces generated by rotary assembly, and allowing averaging out of cyclic errors resulting from non-circularity of the casing.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified rotor system of West such that the means to close the gap between the rotary assembly and the casing is by axial displacement of casing segments mounted upon an eccentric rotation arrangement whereby rotation of the eccentric rotation arrangement alters the angular presentation between each segment and the rotary assembly in order to vary the gap between them to the desired value, and such that the sensor comprises multiple sensors, as taught by Colley, for the respective purposes of providing high actuating forces on the casing to overcome sealing forces generated by rotary assembly, and allowing averaging out of cyclic errors resulting from non-circularity of the casing.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over West 3,227,418 and Japanese Patent 6-137,106 as applied to claim 1 above, and further in view of European Patent Application 578,285. The modified rotor system calibration arrangement of West shows

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all of the claimed subject matter, including a control means 66 that acts to open the gap to a desired value, but does not show that the control means includes means to periodically set a reference datum for the desired value of the gap.

European Patent Application 578,285 shows a rotor system clearance control arrangement whereby a control means 118 acts to open a clearance gap between a rotary assembly 58 and a casing 16 to a desired value, with the control means including means to periodically set a reference datum for the desired value of the gap (see column 4, lines 37-49 noting the comparison of the real time value of the gap with the schedule of magnitudes of the gap), for the purpose of adjusting the gap clearance to maximize the efficiency.

It would have been further obvious at the time the invention was made to a person having ordinary skill in the art to form the modified rotor system of West such that the control means includes means to periodically set a reference datum for the desired value of the gap, as taught by European Patent Application 578,285, for the purpose of adjusting the gap clearance to maximize the efficiency.

***Allowable Subject Matter***

Claims 8 and 11-12 are allowed.

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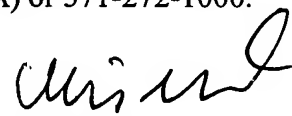
Claims 21-23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

C.V.  
July 7, 2006



Christopher Verdier  
Primary Examiner  
Art Unit 3745